# Question NO: 2

Let $z = e^{2x} \sin y$    Find

(a) $\dfrac{\partial z}{\partial x}$    (b) $\dfrac{\partial z}{\partial y}$,    (c) $\dfrac{\partial z}{\partial x}\Big|_{(0,y)}$

(d) $\dfrac{\partial z}{\partial x}\Big|_{(x,0)}$    (e) $\dfrac{\partial z}{\partial y}\Big|_{(0,y)}$    (f) $\dfrac{\partial z}{\partial y}\Big|_{(x,0)}$

(g) $\dfrac{\partial z}{\partial x}\Big|_{(\ln 2,0)}$    (h) $\dfrac{\partial z}{\partial y}\Big|_{(\ln 2,0)}$

## Solution:

(a)    $\dfrac{\partial z}{\partial x} = ?$    $z = e^{2x} \sin y$

Apply $\dfrac{\partial}{\partial x}$ on both side

$$\frac{\partial}{\partial x} z = \frac{\partial}{\partial x}\left( e^{2x} \sin y \right)$$

$$\frac{\partial z}{\partial x} = \sin y \cdot \frac{\partial}{\partial x}\left( e^{2x} \right)$$

$$\frac{\partial z}{\partial x} = \sin y \cdot e^{2x} \cdot 2$$

$$\frac{\partial z}{\partial x} = \sin y \cdot 2 e^{2x}$$

$$\frac{\partial z}{\partial x} = 2 e^{2x} \sin y$$

(b)    $\dfrac{\partial z}{\partial y} = ?$    $z = e^{2x} \sin y$

Apply partial derivative w.r.t 'y'
on both Sides

$$z = e^{2x} \sin y$$

$$\frac{d}{dy} \cdot z = \frac{d}{dy}\left[e^{2x} \sin y\right]$$

$$\frac{dz}{dy} = e^{2x} \frac{d}{dy}(\sin y)$$

$$\frac{dz}{dy} = e^{2x} \cdot \cos y$$

$$\frac{dz}{dy} = e^{2x} \cos y$$

(C) $\left.\frac{dz}{dx}\right|_{(0,y)} = ?$  $z = e^{2x} \sin y$

Apply partial derivative w.r.t$^6$ $x^9$
on both side.

$$z = e^{2x} \sin y$$

$$\frac{d}{dx} \cdot z = \frac{d}{dx}\left[e^{2x} \sin y\right]$$

$$\frac{dz}{dx} = \sin y\left[\frac{d}{dx} e^{2x}\right]$$

$$\frac{dz}{dx} = \sin y\left(2e^{2x}\right)$$

$$\frac{dz}{dx} = 2e^{2x} \sin y$$

$$\frac{\partial z}{\partial x}\Big|_{(0,y)} = ?$$

$$\frac{\partial z}{\partial x}\Big|_{(0,y)} = 2 \cdot e^{2(0)} \, Siny$$

$$\frac{\partial z}{\partial x}\Big|_{(0,y)} = 2(1) \, Siny$$

$$\frac{\partial z}{\partial x}\Big|_{(0,y)} = 2 \, Siny \quad Ans.$$

(d) $\frac{\partial z}{\partial x}\Big|_{(x,0)} = ? \quad z = e^{2x} \, Siny$

$$\left[ \because \frac{\partial z}{\partial x} = 2e^{2x} \, Siny \right]$$

$$\frac{\partial z}{\partial x}\Big|_{(x,0)} = 2e^{2x} \, Sin(0)$$

$$\frac{\partial z}{\partial x}\Big|_{(x,0)} = 2e^{2x}(0)$$

$$= 0 \quad Ans$$

(e) $\frac{\partial z}{\partial y}\Big|_{(0,y)} = ? \quad z = e^{2ox} \, Siny$

$$\because \frac{\partial z}{\partial y} = e^{2x} \, Cosy$$

$$\frac{\partial z}{\partial y}\Big|_{(0,y)} = e^{2(0)} \, Cosy$$

$$= (1) \, Cosy$$

$$= Cosy \quad Ans$$

(f) $\dfrac{\partial z}{\partial y}\Big|_{(x,0)} = ?$    $z = e^{2x} \sin y$

$$\therefore \dfrac{\partial z}{\partial y} = e^{2x} \cos y$$

$$\dfrac{\partial z}{\partial y}\Big|_{(x,0)} = e^{2x} \cos 0° \quad [\cos 0° = 1]$$

$$= e^{2x} (1)$$

$$= e^{2x} \text{ Ans}$$

(g) $\dfrac{\partial z}{\partial x}\Big|_{(\ln 2,0)} = ?$    $z = e^{2x} \sin y$

$$\left[ \therefore \dfrac{\partial z}{\partial x} = 2 e^{2x} \sin y \right]$$

$$\dfrac{\partial z}{\partial x}\Big|_{(\ln 2,0)} = 2 e^{2(\ln 2)} \cdot \sin 0$$

$$= 2 e^{2(\ln 2)} (0) \quad [\therefore \sin 0 = 0]$$

$$= 0$$

$$\frac{\partial z}{\partial y}\Big|_{(\ln 2,\, 0)} = ? \qquad z = e^{2x} \sin y$$

$$\left[ \because \frac{\partial z}{\partial y} = e^{2x} \cos y \right]$$

$$\frac{\partial z}{\partial y}\Big|_{(\ln 2,\, 0)} = e^{2(\ln 2)} \cos 0$$

$$\left[ \log a^b = b \log a \right]$$

$$= e^{\ln(2)^2} \cos 0$$

$$= (2)^2 (1)$$

$$= 4 \text{ Ans}$$